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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/561,318

Applicant(s)

BUTENDEICH ET AL.

Examiner

Abul Kalam

Art Unit

2814

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 15 May 2006.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,4-15,17 and 18 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,4-9,11-15,17 and 18 is/are rejected.
- 7) ☒ Claim(s) 10 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 20 December 2005 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
- 1) ☒ Certified copies of the priority documents have been received.
 - 2) ☐ Certified copies of the priority documents have been received in Application No. _____.
 - 3) ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

DETAILED ACTION

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

1. Claim 18 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In lines 2-3 of claim 18, the limitation of "the highest possible active doping" is unclear and ambiguous because the term is relative and is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention. What does applicant mean by "highest possible active doping?"

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. **Claims 1, 5, 6, 12-15 and 18** are rejected under 35 U.S.C. 102(b) as being anticipated by **Nakatsu (US 6,081,540; previously cited)**.

With respect to **claim 1**, **Nakatsu** teaches (**FIG. 3**) a radiation-emitting semiconductor component with a layer structure comprising:

an n-dope confinement layer **(13, “clad layer”)**, a p-doped confinement layer **(15, “clad layer”)**, and an active layer, photon emitting layer **(14)** disposed between said n-doped confinement layer and said p-doped confinement layer;

wherein said n-doped confinement layer **(13)** comprises a first n-dopant **(silicon, col. 7: Ins. 65-67)**; and

said active layer **(14)** comprises a second n-dopant **(selenium, sulfur, tellurium or nitrogen, col. 8: Ins. 29-33 and col. 10: Ins. 22-24)**, different from the first dopant.

Regarding the limitation of “a sharp doping profile,” in line 8 of claim 1, note that claimed properties are presumed to be inherent when the structure or method of a reference is substantially identical to that of the claims **(MPEP 2112.01)**.

In applicants invention, the first n-dopant is silicon and the second n-dopant is tellurium. **Nakatsu** teaches that the n-doped confinement layer is doped with a first n-dopant of silicon **(col. 7: Ins. 65-67)** and that the active layer may be doped with a second n-dopant of tellurium **(col. 9: Ins. 22-24)**. Where the claimed and prior art products are identical or substantially identical in structure or composition, or are produced by identical or substantially identical processes, a prima facie case of either anticipation or obviousness has been established. *In re Best*, 562 F.2d 1252, 1255, 195 USPQ 430, 433 (CCPA 1977) and MPEP 2112.01.

With respect to **claim 5**, **Nakatsu** teaches wherein the said semiconductor component **(FIG. 3)** is an LED **(col. 7: Ins. 61-67)**.

With respect to **claim 6**, **Nakatsu** teaches wherein said active layer **(14)** of said LED is comprises a homogeneous layer (**col. 9: Ins. 32-35**). **Nakatsu** discloses a homo-junction type LED and thus implicitly teaches a homogeneous type active layer.

With respect to **claim 12**, **Nakatsu** teaches wherein said first n-dopant comprises silicon (**col. 7: Ins. 62-67**).

With respect to **claim 13**, **Nakatsu** teaches wherein said second n-dopant tellurium (**col. 9: Ins. 22-24**).

With respect to **claim 14**, **Nakatsu** teaches wherein said p-doped confinement **(15)** layer comprises zinc (**col. 7: Ins. 62-67 and col. 8: Ins. 1-6**).

With respect to **claim 15**, **Nakatsu** teaches wherein said layer structure comprises a basis of AlGaInP (**col. 7: Ins. 61-67**).

With respect to **claim 18**, *as best understood by the Office*, **Nakatsu** teaches wherein said n-doped confinement layer **(13)** comprises said first n-dopant ("**Si doped**," **col. 7: Ins. 62-67**).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. **Claim 4 and 17** are rejected under 35 U.S.C. 103(a) as obvious over **Nakatsu ('540)**.

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With respect to **claims 4 and 17**, **Nakatsu** teaches all the limitations of the claims, as set forth above in claim 1, with the exception of explicitly disclosing wherein said n-doped confinement layer is doped with said second n-dopant.

However, **Nakatsu** teaches that a selenium and magnesium-doped active layer **(14)** is formed above the silicon-doped confinement layer **(13)** (**col. 7: Ins. 61-67**).

Thus, it is implicit that some of the selenium and magnesium dopants diffuse into the n-doped confinement layer, during the chemical vapor deposition process (**col. 8: Ins. 1-5**). Furthermore, the limitation, "is doped both with said first n-dopant and with an additional dopant," is a product by process limitation and therefore given no patentable weight.

A product by process claim is directed to the product per se, no matter how actually made, *In re Hirao*, 190 USPQ 15 at 17 (footnote 3). See *In re Fessman*, 180 USPQ 324, 326 (CCPA 1974); *In re Marosi et al.*, 218 USPQ 289, 292 (Fed. Cir. 1983); *In re Brown*, 459 F.2d 531, 535, 173 USPQ 145, 147 (CCPA 1969); *Buono v. Yankee Maid Dress Corp.*, 77 F.2d 274, 279, 26 USPQ 57, 61 (2d. Cir. 1935); and particularly *In re Thorpe*, 227 USPQ 964, 966 (Fed. Cir. 1985), all of which make it clear that it is the patentability of the final structure of the product "gleaned" from the process steps, which must be determined in a "product by process" claim, and not the patentability of the process. See also MPEP 2113. Moreover, an old and obvious product produced by a new method is not a patentable product, whether claimed in "product by process" claims or not.

4. **Claim 7** is rejected under 35 U.S.C. 103(a) as being unpatentable over **Nakatsu (US 6,081,540)**, as applied to claims 1 and 5 above, and further in view of **Ishikawa et al. (US 5,696,389; previously cited)**.

With respect to **claim 7**, **Nakatsu** teaches all the limitations of the claim, as set forth above in claims 1 and 5, with the exception of disclosing: wherein said active layer of said LED comprises a quantum well or multiple quantum well.

However, **Ishikawa** teaches a light-emitting semiconductor device wherein an active layer may have a single-hetero junction, a homogeneous junction or a quantum well structure (**col. 36: Ins. 40-45**). Furthermore, **Nakatsu** teaches that his invention may be applied to single-hetero type structure or homo-junction type structures (**col. 9: Ins. 32-35**).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the device of **Nakatsu** with the teaching of **Ishikawa**, to form the active layer with a quantum well structure, because it would have been considered a mere substitution of art recognized equivalent structures (MPEP 2144.06).

Substitution of equivalents requires no express motivation as long as the prior art recognizes the equivalency. *In re Fount* 213 USPQ 532 (CCPA 1982); *In re Siebentritt* 152 USPQ 618 (CCPA 1967); *Graver Tank & Mfg. Co. Inc. v. Lindle Air Products Co.* 85 USPQ 328 (USSC 1950).

5. **Claims 8, 9 and 11** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Nakatsu ('540)**, as applied to claim 1 above, and further in view of **Anayama (US 2002/0027935; previously cited)**.

With respect to **claim 8**, **Nakatsu** teaches all the limitations of the claim, as set forth above in claims 1 and 5, with the exception of disclosing: wherein said semiconductor component is a laser diode in which a first waveguide layer is disposed between said active layer and said n-doped confinement layer and a second waveguide layer is disposed between said active layer and said p-doped confinement layer.

However, **Anayama** teaches a laser diode (**FIG. 15J**) in which a first waveguide layer (**58, 59; pgs. 7-8: [0131]-[0132]**) is disposed between said active layer (**60; pg. 8: [0135]**) and said n-doped confinement layer (**54-57; pg. 7: [0125]**) and a second waveguide layer (**61, 62; pg. 8: [0136]-[0137]**) is disposed between said active (**60**) layer and said p-doped confinement layer (**63-65; pg. 8: [0138]**).

With respect to **claim 9**, **Anayama** teaches wherein the first waveguide layer (**59**) is un-doped (**pg. 8: [0132]**).

With respect to **claim 11**, **Anayama** teaches wherein the second waveguide layer (**61**) is un-doped (**pg. 8: [0136]**).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the device of **Nakatsu** with the teaching of **Anayama**, to form waveguide layers interposed between n-doped and p-doped confinement layers and the active layer, for the purpose of forming a laser diode capable of operating for a long duration without losing efficiency (**pg. 10: [0154]**).

Allowable Subject Matter

6. **Claim 10** is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter: With respect to claims 10, the prior art of record neither anticipates nor renders obvious all the limitations of the claim including: wherein the n-doped confinement layer is doped with a first n-dopant and the active layer is doped with a second n-dopant, wherein the first and second n-dopants are different, and wherein a first waveguide layer is doped with said second n-dopant and is disposed between the active layer and the n-doped confinement layer.

Response to Arguments

7. Applicant's arguments filed March 16, 2007 have been fully considered but they are not persuasive.

Applicant argues that Nakatsu does not disclose, teach, or suggest an "n-doped confinement layer [which] comprises a first n-dopant with a sharp doping profile." This is not persuasive because in Applicant's specification, on page 2, paragraph [0040], it is stated that silicon is used as the first n-dopant for the n-doped InAlGaP confinement layer, and that this achieves a doping profile that exhibits a sharp drop off. Nakatsu also teaches a layer of InAlGaP which is doped with silicon (col. 7: lns. 65-67). Thus, since the claimed and prior art products are identical or substantially identical in

structure or composition, or are produced by identical or substantially identical processes, a prima facie case of either anticipation or obviousness has been established. *In re Best*, 562 F.2d 1252, 1255, 195 USPQ 430, 433 (CCPA 1977) and MPEP 2112.01. Furthermore, note that Applicant has not specified how sharp the doping profile has to be .

Applicant also argues that the combination of Nakatsu and Ishikawa, in the rejection of claim 7, and the combination of Nakatsu and Anayama, in the rejection of claims 8, 9 and 11, would not have been obvious to one skilled in the art at the time of the invention. The argument is not persuasive because the Office provided reasons for the combination, which was not addressed nor refuted by the Applicant. Furthermore, the Applicant simply states that they "do not concede that the combination...would have been obvious to one skilled in the art at the time of the invention," without providing any reasoning or support for such a statement.

Conclusion

8. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not

mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Abul Kalam whose telephone number is 571-272-8346. The examiner can normally be reached on Monday - Friday, 9 AM - 5 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael M. Fahmy can be reached on 571-272-1705. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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